The opinion in support of the decision being entered today was ***not*** written for publication and is ***not*** binding precedent of the Board.

Paper No. 23

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte MICHIO SATO, TAKASHI YAMANOBE,
TOHRU KOMATSU, YOSHIHARU FUKASAWA, NORIAKI YAGI,
TOSHIHIRO MAKI and HIROMI SHIZU

Appeal No. 1998-1728
Application 08/397,243

HEARD: January 18, 2001

Before GARRIS, WARREN and LIEBERMAN, *Administrative Patent Judges*.

WARREN, *Administrative Patent Judge*.

Decision on Appeal

This is an appeal under 35 U.S.C. § 134 from the decision of the examiner finally rejecting claims 1 through 5 and 11 through 13. Claims 6 through 10, also of record, have been allowed by the examiner. Claims 1 and 2, as they stand of record (specification, page 68), are illustrative of the claims on appeal:

1. A refractory metal silicide target, comprising a fine mixed structure composed of MSi_2 (where M: at least one refractory metal selected from W, Mo, Ti, Ta, Zr, Hf, Nb, V, Co, Cr, Ni) grains and Si grains, wherein the number of MSi_2 grains independently existing in a cross section of 0.01 mm^2 of the mixed structure is not greater than 15, the MSi_2 grains have an average grain size not greater than

10µ m, whereas free Si grains existing in gaps of the MSi_2 grains have a maximum grain size not greater than 20µ m.

2. A refractory metal silicide target according to claim 1, wherein when the average value of a Si/M atomic ratio in the entire sputtering is assumed to be X, the dispersion of the Si/M atomic ratio in an arbitrary cross section of 1 mm^2 in the mixed structure is in a range of $X \pm 0.02$.

The appealed claims, as represented by claim 1,[1] are drawn to a refractory metal silicide target comprising at least a fine mixed structure composed of specified MSi_2 (metal silicide) grains and Si (silicon) grains. The metal silicide grains have an average grain size not greater than 10 µm and the free silicon grains existing in gaps of the silicide grains have a maximum grain size not greater than 20 µm. The number of metal silicide grains independently existing in a cross section of 0.01 mm^2 of the mixed structure is not greater than 15. In claim 2, the silicon/metal atomic ratio across the target can vary from the average value of this ratio by ± 0.02. According to appellants, since silicon in a mixed structure of the target is "more deeply eroded than" metal silicide during sputtering, it is preferable that the mixed structure is "arranged such that [metal silicide] grains are coupled . . . like a chain and [silicon] exist in the gaps of the [metal silicide] grains to reduce particles generated in a target because [metal silicide] grains are liable to be removed or dropped from an eroded surface in a position where [metal silicide] independently exists in [silicon] phase" (specification, page 15; see also, e.g., pages 9-12).

The reference relied on by the examiner is:

Satou et al. (Satou)	5,418,071	May 23, 1995
		(filed Feb. 4, 1993)

The examiner has rejected the appealed claims under 35 U.S.C. § 103 as being unpatentable over Satou. We affirm.

Rather than reiterate the respective positions advanced by the examiner and appellants, we refer to the examiner's answer and to appellants' brief for a complete exposition thereof.

Opinion

We have carefully reviewed the record on this appeal and based thereon find ourselves in agreement with the examiner that the claimed refractory metal silicide target encompassed by appealed claims 1 and 2 would have been obvious over Satou to one of ordinary skill in this art at the time the claimed invention was made.

Our consideration of the issues involved with the application of Satou to appealed claims 1 and 2 necessarily entails the interpretation of the claimed invention encompassed by these appealed claims. In doing so, we must give the broadest reasonable interpretation to the terms of these claims consistent with appellants' specification as it would be interpreted by one of ordinary skill in this art. *See In re Morris*, 127 F.3d 1048, 1054-55, 44 USPQ2d 1023, 1027 (Fed. Cir. 1997). We find that one of ordinary skill in this art would have recognized from appellants' specification (e.g., pages 14-15) that the metal silicide "grains independently existing" are the metal silicide grains that are not "coupled" to other metal silicide grains "like a chain" and that it is the spaces between such "chains" that are the "gaps" in which "free" silicon grains can reside. Thus, contrary to the examiner's apparent interpretation, we interpret the "number of [metal silicide] grains independently existing in a cross section" to mean the number of such grains that are *not* in a "chain," and not the *total* number of metal silicide grains, "chained" and not "chained," which may be present in the cross section.[2]

In applying Satou to the appealed claims, we find that just as in appellants' specification (e.g., pages 14-15), Satou discloses that the metal silicide "grains are coupled to each other to form a linked structure" with silicon "distributed discontinuously in the gaps between the" metal silicide grains (col. 8, lines 9-12, and col. 9, lines 4-7; see also, e.g., col. 6, lines 40-49), and states that

> [w]hen the [metal silicide] grains are *separately distributed* in the [silicon] phase, the [silicon] phase, having a greater sputtering rate, is initially eroded during the sputtering process, so that [metal silicide] phase tends to drop out. To avoid this occurrence, it is necessary that the [metal silicide] phase grains are coupled together in an interlinked structure. [Col. 8, lines 12-18; emphasis supplied.]

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[1] Appellants state in their brief (page 4) that the appealed claims "stand or fall with claim 1" with the exception of "[c]laim 2 [which] stands or falls separately from claim 1." Thus, we decide this appeal based on appealed claims 1 and 2. 37 CFR § 1.192(c)(7) (1995).

[2] See, e.g., the examiner's reliance on the total number of metal silicide grains disclosed in Satou (e.g., col. 7, lines 58-59) with respect to the "first limitation" of appealed claim 1 (answer, e.g., pages 3-4).

Thus, Satou discloses that “separately distributed” metal silicide grains exist in the fine mixed structure and are to be avoided even though the reference does not quantify the amount of such “independently existing” grains as in the appealed claims and appellants’ specification (e.g., page 10).

We further find that, as pointed out by the examiner (answer, page 4), Satou teaches that the generation of particles during sputtering can be further reduced when the average grain size of the metal silicide phase is desirably from 2 to 15 µm and preferably from about 5 to 10 µm (col. 8, lines 43-48), and the maximum silicon grain sized is preferably 20 µm or less, with the average silicon grain size preferably 2 to 10 µm (col. 9, lines 21-22 and 26-28). Satou reports in Table 2 that in Satou Example 1, the average grain size of the metal silicide grains is 2 µm and of silicon grains is 7 µm. It is apparent that the preferred grain sizes of metal silicide taught by Satou and the metal silicide grain size reported for Satou Example 1 fall within the corresponding limitation of claim 1. The average silicon grain size reported for Satou Example 1 would reasonably appear to include free silicon grains having a maximum size of 20 µm or less as specified in claim 1, and thus the reported and preferred silicon grain sizes fall within the corresponding limitation of claim 1.

We also find that Satou teaches that “there is a relationship between the density of the target and the quantity of the particles generated” such that “it is desirable to achieve a relative density of more than 99%” (col. 13, lines 3-9), and reports a density of 99.8% for Satou Example 1 in Table 2. While there is no claim limitation corresponding to the density of the fine mixed structure, appellants disclose in their specification that “the density ratio of the target is not less than 99%” and “preferably not less than 99.8% over the entire target” (page 16) as shown for specification Examples 1-10 as reported in specification Table 2, which latter value is that reported for Satou Example 1. We further find that Satou reports in Table 2 thereof that the “number of particles generated from the target” (col. 19, line 35) prepared with Satou Example 1 is “12” (cols. 19-20), which value falls within the range of “Number of Particles (Pieces)” formed with the targets of specification Examples 1-10 as reported in specification Table 2.

Satou further teaches that in preparing the fine mixed structure, the powders are *uniformly* mixed together with the silicon/metal atom ratio of about 2.0 to 4.0, wherein “it is preferred to use metal powder of a maximum grain size of 10 µm or less and [silicon] powder of a maximum grain size of 30 µm or less" to form "a minute structure," and cautions that "[a]n uneven mixture is undesirable because the composition and structure of the resultant target become uneven" (col. 13, lines 51-68; see also, e.g., col. 11, line 41, to col. 12, line 2). We find that appellants disclose in their specification that the metal and silicon having the same grain sizes are uniformly mixed with a silicon/metal atomic ratio of 2.0 to 4.0 (e.g., page 16, first full paragraph; page 18, full paragraph, and paragraph bridging pages 19-20) and require in claim 2 that the silicon/metal atomic ratio across the target can vary from the average value of this ratio by ± 0.02. Thus, even though Satou does not disclose the extent of the uniformity of the silicon/metal atomic ratio distribution across the target, we must agree with the examiner (answer, page 4) that it reasonably appears that the said ratio would vary across the targets of Satou, such as that of Satou Example 1, within the limitation specified in claim 2.

We find that the process of preparing the fine mixed structure of the target disclosed by Satou differs from that disclosed and claimed by appellants. However, as noted above, the targets disclosed by Satou reasonably appear to have the same characteristics as recited in the appealed claims and otherwise disclosed by appellants, and thus, on this record, we must agree with the examiner (answer, pages 5-6) that, *prima facie*, there is no discernable difference between the claimed and prior art targets that would appear to be the result of the process by which the fine mixed structure is prepared. Indeed, this would be so even if the appealed claims included limitations that characterize the encompassed claimed target at least in part by the process by which it is made. *See, e.g.*, *In re Thorpe*, 777 F.2d 695, 697, 227 USPQ 964, 966 (Fed. Cir. 1985).

Thus, based on this evidence, we must agree with the examiner's position that the claimed invention encompassed by claim 1, as we have interpreted it above, would have been *prima facie* obvious over Satou because, on this record, it reasonably appears to us that one of ordinary skill in this art in following the teachings of the reference would have arrived at a refractory metal silicide target comprising at least a fine mixed structure composed of metal silicide grains and silicon grains that is identical or substantially identical to the claimed refractory metal silicide target even though the number of independently existing metal silicide grains is not taught by Satou and the process of making fine mixed structures disclosed in the present application is different from that taught by Satou.[3] Accordingly, the burden falls upon appellants to establish by effective argument or objective evidence that the claimed invention patentably distinguishes over the disclosure of Satou even though the rejection is based on § 103. *In re Spada*, 911 F.2d 705, 708-09, 15 USPQ2d 1655, 1657-58 (Fed. Cir. 1990); *In re Best*, 562 F.2d 1252, 1254-56, 195 USPQ 430, 432-34 (CCPA 1977); *Wertheim*, *supra*; *In re Skoner*, 517 F.2d 947, 950-51, 186 USPQ 80, 82-83 (CCPA 1975). Furthermore, while the issue here has been framed by the examiner as one of obviousness under § 103, it reasonably appears to us that the target of Satou Example 1 falls within appealed claims 1 and 2, which is indeed evidence of a lack of novelty of the claimed invention as encompassed by the appealed claims that is, of course, "the ultimate of obviousness." *In re Fracalossi*, 681 F.2d 792, 794, 215 USPQ 569, 571 (CCPA 1982); *Wertheim*, *supra*; *Skoner, supra*. Thus, to the extent that the target of Satou Example 1 anticipates the claimed target encompassed by appealed claims 1 and 2, the case of obviousness is irrebuttable. *Fracalossi, supra*.

Accordingly, since a *prima facie* case of obviousness has been established over the applied prior art, we have again evaluated all of the evidence of obviousness and nonobviousness based on the record as a whole, giving due consideration to the weight of appellants' arguments and the evidence in the specification. *See generally*, *Spada*, 911 F.2d at 707 n.3, 15 USPQ2d at 1657 n.3*; In re Johnson*, 747 F.2d 1456, 1460, 223 USPQ 1260, 1263 (Fed. Cir. 1984); *In re Piasecki*, 745 F.2d 1468, 1472, 223 USPQ 785, 788 (Fed. Cir. 1984).

We have carefully considered all of appellants' arguments and the evidence presented in the specification. Appellants essentially present two arguments. First, appellants allege that the claimed target encompassed by appealed claims 1 and 2 is distinguished from that of Satou by the number of independently existing metal silicide grains in the fine mixed structure as specified in the appealed claims

[3] We recognize that the examiner has allowed the claimed process encompassed by pending claims 6 through 10 after consideration of Satou. However, we are concerned here with the patentability of the claimed product encompassed by the appealed claims. *Cf. In re Wertheim*, 541 F.2d 257, 271, 191 USPQ 90, 103-04 (CCPA 1976).

and submit, in this respect, that Satou does not recognize that the number of such grains should be limited but rather specifies "the average number of the coagulated [metal silicide] grains in order to suppress the particle generation," citing Satou, col. 8, lines 37-38 (brief, pages 4-7). We are not convinced by this argument that the claimed and prior art targets are distinguishable based on the cited disclosure of Satou.

As we have discussed above, appellants' claims and specification and Satou both describe the *same* characteristics of the fine mixed structure of the target with the sole exception of the *number* of the metal silicide grains, said grains being described by Satou as "separately distributed" in a "linked structure," and by appellants as "independently existing" in a "chain" structure. Based on the disclosures in appellants' specification and in Satou, we find that the "structure" in each instance are the *same.* Indeed, we find no disclosure in Satou with respect to "coagulated" *metal* grains as discussed by appellants (brief, page 6), which would have presented a different characterization of the silicide metal grains in the "linked structure" to one of ordinary skill in this art. The whole of that part of Satou which includes lines 37-38 of col. 8 relied on by appellants, reads as follows:

> [T]he size of [metal silicide] depends on the diameter of the *metal* grains forming the metal silicide. However, most of the metal grains are coagulated so that [metal silicide] grains of different diameters are produced. An increase in the variation of the range of grain diameters causes projections and recesses on the eroded surface from sputtering to become significant. Because of the increased variation in the surface level, the number of particles generated increases. For this reason, it is necessary to use *uniformly* sized grains, and it is desirable that the average grain diameter of the [metal silicide] phase be from 2 to 15 µm and preferably from about 5 to 10 µm. [Col. 8, lines 35-48; emphasis supplied.]

We are of the view that one of ordinary skill in this art would have read this disclosure of Satou with the further disclosure in the reference with respect to the process used therein, that

> the grain sizes of the two powders significantly affect the grain sizes of the synthesized [metal silicide] and [silicon] dispersed between the [metal silicide] grains. In order to provide a *minute structure*, it is preferable to use *metal* powder of a *maximum* grain size of 10 µm or less and [*silicon*] powder of a *maximum* grain size of *30 µm or less*. [Col. 13, lines 55-61; emphasis supplied.]

Thus, we find that one of ordinary skill in this art would have reasonably expected from the teachings of Satou to prepare a fine mixed structure having preferred uniformly sized metal silicide grains of from 2 to

15 µm and preferably from about 5 to 10 µm which would be arranged in a "minute," "linked structure," by using metal powders of 10 µm or less in combination with silicon powder of 30 µm or less in the process taught therein. Indeed, Satou exemplifies the use of such powder sizes in Example 1 (col. 16, lines 6-10) to obtain a target containing metal silicide grains and silicon grains with an average grain diameter of 2 µm and 7 µm, respectively (Satou Table 2), which reasonably appear to satisfy the limitations of the appealed claims as we found above.

Second, appellants submit that "the structure of the [Satou] target is quite different from that of the present invention at the point of limiting the number of [metal silicide] grains independently existing in the unit area of the target structure" (brief, page 10). In this respect, appellants allege that the "unexpected advantage of reducing the number of particles is clearly described in Tables 2 (page 43) and 7 (pages 64-65) of the specification together with comparison data of *prior art* targets," which includes a comparison of the "data for Examples 1-10, made according to the above-described process [defined in claim 6], and Comparative Examples 1-6, made according to a process *similar* to Satou, using only high pressure, with no low pressure step," that is also described at Table 1 and page 41, first paragraph, as well as in FIGS. 1A and 2A and FIGS. 3A and 4A, corresponding to specification Examples 1 and 6 and Comparative Examples 1 and 4 (brief, page 8; italic emphasis supplied; see also pages 7-12).

Upon carefully considering this evidence in light of appellants' arguments, we cannot agree with appellants that the same reliably establishes that "the process disclosed by Satou does not produce the presently claimed target" (brief, page 10). It is well settled that the burden of establishing the significance of data in the record, with respect to unexpected results or for other purposes, rests with appellants, which burden is not carried by mere arguments of counsel. *See generally*, *In re Geisler*, 116 F.3d 1465, 1470, 43 USPQ2d 1362, 1365-66 (Fed. Cir. 1997); *In re Merck & Co.*, 800 F.2d 1091, 1099, 231 USPQ 375, 381 (Fed. Cir. 1986); *In re Longi*, 759 F.2d 887, 897, 225 USPQ 645, 651-52 (Fed. Cir. 1985); *In re Borkowski*, 505 F.2d 713, 718, 184 USPQ 29, 33 (CCPA 1974); *In re Klosak*, 455 F.2d 1077, 1080, 173 USPQ 14, 16 (CCPA 1972); *In re D'Ancicco*, 439 F.2d 1244, 1248, 169 USPQ 303, 306 (CCPA 1971). An explanation of the significance of the evidence is particularly relevant where, as here, it is apparent from the record that there is no direct or indirect evidence reflecting the closest prior art which is Satou, and indeed, there is no explanation or evidence in the record which establishes that the evidence of record can be extrapolated to a reliable comparison of the claimed target and the target of Satou in a manner which addresses the thrust of the rejection under § 103. *See generally, In re Burckel*, 592 F.2d 1175, 1179, 201 USPQ 67, 71 (CCPA 1979); *In re Merchant*, 575 F.2d 865, 868, 197 USPQ 785, 787 (CCPA 1978); *In re Blondel*, 499 F.2d 1311, 1317, 182 USPQ 294, 298 (CCPA 1974).

With respect to the comparison provided in specification Tables 1 and 2,[4] we find from a comparison of the processes for preparing the specification Examples 1-10 (pages 36-37), the Comparative Examples 1-6 (page 38) and the process taught by Satou (col. 13, line 51, to col. 15, line 68, col. 16, lines 6-26, and Table 1) that there are a considerable number of differences between these three processes, which differences we separate into those involved with preparing the powder mixture and those involved with silicide synthesis, sintering and densification. The differences with respect to preparing the powder mixture include: (1) the maximum size of the silicon grains used in the Comparative Examples is 50 µm, while the maximum size used in the specification Examples is 30 µm, which latter grain size is specified in Satou to obtain "a minute structure" and used in Satou Example 1 (col. 13, lines 58-61, and col. 16, lines 6-10); (2) the maximum size of the metal grains used in at least the specification Examples, if not also the Comparative Examples,[5] is 15 µm while the maximum size specified in Satou in order to obtain "a minute structure" and used in Satou Example 1 is 10 µm (*id*.); (3) while it would appear that the silicon/metal atomic ratio for the specification Examples falls within the range of 2-4 (specification, page 18), the same presumption cannot be made with respect to the specification Comparative Examples in view of the silicon grain size, and a value within this atomic ratio

[4] We limit our discussion to the data respecting specification Examples 1-10 and Comparative Examples 1-6 reported in Tables 1 and 2 and to FIGS. 1A, 2A, 3A and 4A, which appellants extensively discuss in the brief. While appellants also mention specification Table 7 (brief, page 8), they have not discussed in connection therewith either the preparation of specification Examples 24-34 and Comparative Examples 16-26 or the reported density measurements for these targets vis-à-vis the teachings of Satou. We will not examine the evidence in Table 7 in greater detail than argued by appellants.

[5] The "M powder" in the Comparative Examples is disclosed to be "*equal* to that used in Examples 1 – 10" (specification, page 38, lines 2-3; emphasis supplied).

range is required by Satou and used in Satou Example 1 (col. 13, lines 62-65; col. 16, line 10); (4) there are different mixing procedures used in the specification Examples and Comparative Examples without assurance that a *uniform* mixture of the metal and silicon grains is obtained in the Comparative Examples, and Satou requires mixing "to obtain a uniform mixture" (col. 13, lines 64-65); and (5) Satou discloses that the powder mixture is heated to reduce the content of oxygen and other contaminates and uses this step in preparing Satou Example 1 (col. 14, lines 1-54, col. 16, lines 18-21 and Table 1), while deoxidation prior to silicide synthesis is not used in the processes of the specification Examples and Comparative Examples.[6]

The differences in silicide synthesis, sintering and densification include: (6) Satou conducts the silicide synthesis with the deoxidized powder mixture at a temperature of 1,000° to 1,300°C, depending on the silicide synthesis temperature of the metal, at less than 20° C/minute and a desirable pressure of from 100 to 400 kg/cm^2, as exemplified by Satou Example 1 (col. 14, line 55, to col. 15, line 27, col. 16, lines 22-23, and Table 1),[7] while the processes of the specification Examples and Comparative Examples heat the powder mixture up to 1300°C with different heating schedules and use different vessels in doing so (pages 36 and 38);[8] (7) while it would appear that the silicide material is "crushed" in the Comparative Examples (specification, page 38, line 11) as in the Examples, the same is not

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[6] The specification discloses that the temperature used in the silicide synthesis is determined "taking the reduction of the oxygen content into consideration" (paragraph bridging pages 23-24) and that an optional deoxidizing step can be used in connection with the "crushed powder" step following silicide synthesis (e.g., pages 26-27).

[7] Satou teaches that

> the degassed mixed powder is heated under a high vacuum, and high pressure is applied to synthesize the [metal silicide] phase. In this silicide synthesis step, the heating temperature and the applied pressure must be set at appropriate values so that the silicide reaction progresses gradually, [metal silicide] grain growth is suppressed, and softened [silicon] flows into the gaps between the [metal silicide] grains. [Col. 14, lines 55-62.]

[8] The specification teaches that the synthesis is conducted at up to 1300°C at different heating schedules (*see supra* note 6) without the application of pressure (pages 20-25). We interpret allowed claim 6 to encompass processes wherein step "II" would include the application of pressure in view of the transitional term "comprising." *See generally, In re Baxter*, 656 F.2d 679, 686-87, 210 USPQ 795, 802-03 (CCPA 1981) ("As long as one of the monomers in the reaction is propylene, any other

deoxidized as in the Examples (specification, paragraph bridging pages 36-37, and page 38, lines 11-12),[9] and Satou does not prepare a "crushed powder" and deoxidizes the initial powder mixture prior to silicide synthesis; (8) Satou discloses that a dense sintered structure can be obtained by heating the silicide material below the eutectic temperature at a pressure of about 200 to 400 kg/cm^2 for a period of time in a vacuum, as exemplified by Satou Example 1 (col. 15, lines 28-68, col. 16, lines 22-23, and Table 1),[10] while the process of the specification Examples employs a particular heating schedule at 20 kg/cm^2 up to a temperature of 1380°C, with further heating at this temperature at a pressure of 300 kg/cm^2 (page 37), and the Comparative Examples employs a pressure of 200 kg/cm^2 while the crushed material is "heated up to 1380°C" and then continuing the heating at this temperature at a pressure of 300 kg/cm^2 (page 38);[11] and (9) the targets of the specification Examples and comparative Examples have a diameter of 280 mm and a thickness of 14 mm while the target of Satou Example I has a diameter of 260 mm and a thickness of 6 mm.

We find it manifestly evident from these differences that the comparison between the targets prepared by the processes of specification Examples 1-10 and Comparative Examples 1-6 is not a direct or indirect comparison between targets prepared according to the process disclosed and claimed

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monomer may be present, because the term 'comprises' permits the *inclusion* of other steps, elements, or materials.").

9 *See supra* note 6. We find that allowed claim 6 does not require that the "crushed powder" must be further deoxidized as do allowed claims 7 and 8. Thus, the targets of specification Examples 1-10 are prepared with a step which appellants disclose (specification, pages 26-27) and claim to be optional.

10 Satou discloses that

> the sintered substance is heated under a high vacuum and under a high applied pressure, at just below the eutectic temperature of [silicon] and [metal silicide], to obtain a minute and dense sintered structure. In order to obtain a dense sintered substance, the applied pressure, heating temperature, and heating time at temperature must be controlled. [Col. 15, lines 28-34.]

11 The specification discloses heating the "crushed" silicide powder, adjusted to a silicon/metal atomic ratio of 2-4, below the eutectic temperature in a vacuum at a first pressure of 10-50 kg/cm^2 and then densifying at a second pressure of 200-500 kg/cm^2 (pages 28-34). While the specification and the process of specification Examples 1-10 suggest controlling the heating schedule at the low pressing pressure, we interpret claim 6 to encompass processes wherein the heating of the crushed material to just below the eutectic temperature at the low pressing pressure can be conducted as rapidly as possible.

in appellants' application and the process disclosed by Satou. Indeed, while the process of Comparative Examples 1-6 may represent "prior art targets," as appellants allege, the same are not those of Satou because they are not "made according to a process similar to Satou," as appellants further alleged, and appellants admit as much by pointing to the differences in the heating and pressure schedules in the sintering and densifying steps (brief, pages 7-8 and 9-10) and to the absence of a step of "crushing or pulverizing the refractory metal silicide semi-sintered body" in the process of Satou (*id*., page 9, first full paragraph). With respect to the latter, appellants' conclusion that, in the absence of "crushing or pulverizing," "a powder lump . . . is *likely* to remain in the target structure" with the stated consequences (*id*.; emphasis added) is clearly not supported by any evidence in the record based on the process disclosed in Satou *per se* (*see supra* notes 7 and 10) or on the processes for preparing either the specification Examples or Comparative Examples, and thus is entitled to little, if any, weight. *See In re Lindner*, 457 F.2d 506, 508, 173 USPQ 356, 358 (CCPA 1972) ("This court has said . . . that mere lawyers' arguments unsupported by factual evidence are insufficient to establish unexpected results. [Citations omitted.] Likewise, mere conclusory statements in the specification and affidavits are entitled to little weight when the Patent Office questions the efficacy of those statements. [Citations omitted]"). Indeed, the processes for preparing the Examples and Comparative Examples in the specification both involve a step of crushing the semi-sintered silicide material, as we pointed out above.

We further point to another of the numerous differences, which is the difference in the maximize size of the metal and silicon grains used in preparing the initial powder mixture between the specification Example and Comparative Examples, neither of which conforms to the maximum grain sizes considered by Satou to be necessary to necessary to obtain "a minute structure" (*see supra* pp. 7-8). In addition, it is not apparent whether the maximum size of silicon grains used in the specification Comparative Examples would provide a silicon/metal atomic ratio in the range of 2-4 (*see supra* p. 8).

Thus, in the absence of an explanation, the presence of these and other differences between the processes of the specification Examples 1-10, the specification Comparative Examples 1-6 and as disclosed in Satou constitute such a "welter of unfixed variables" that any actual difference between the claimed target encompassed by appealed claims 1 and 2 and the target taught by Satou which may even be indirectly shown in the results described in appellants' specification and shown in the Figures obtained with the specification Examples and Comparative Examples, would be obscured. Accordingly, the evidence relied on by appellants is entitled to little, if any, weight. *Cf. In re Heyna,* 360 F.2d 222, 228, 149 USPQ 692, 697 (CCPA 1966); *In re Dunn,* 349 F.2d 433, 439, 146 USPQ 479, 483 (CCPA 1965) ("[W]e do not feel it an unreasonable burden on appellants to require comparative examples relied on for non-obviousness to be truly comparative. The cause and effect sought to be proven is lost here in the welter of unfixed variables.").

Furthermore, even if the evidence may be found to establish that there is a patentable difference between a claimed target encompassed by appealed claims 1 and 2 and a target taught by Satou, the record does not establish that such evidence is commensurate in scope with the breadth of the targets encompassed by claims 1 and 2 vis-à-vis the teachings of Satou. Indeed, the comparison provided by specification Examples 1-10 and Comparative Examples 1-6 are not directed to the process parameters taught by Satou to provide the minute, fine mixed structures taught in the reference, such as that exemplified by Satou Example 1 and there is no explanation or evidence of record establishing that the results of the comparison provided can be extrapolated to a comparison of claimed targets and such targets of Satou. *See In re Clemens*, 622 F.2d 1029, 1035-36, 206 USPQ 289, 295-96 (CCPA 1980)("This is not a case in which the probative value of a narrow range of data can be reasonably extended to prove the unobviousness of a broader claimed range. . . . Here, the claimed range includes temperatures below 60°C, temperatures at which CME-based resins would be expected to perform well. Appellants' tests, however, only compare VBC- and CME-based resins at temperatures at which the latter would be expected to perform poorly. There is therefore no basis in this data for predicting the relative performance of VBC- and CME-based resins at temperatures at which the latter would be expected to perform.").

Accordingly, based on our consideration of the totality of the record before us, we have weighed the evidence of obviousness found in Satou with appellants' countervailing evidence of and argument for nonobviousness and conclude that the claimed invention encompassed by appealed claims 1 through 5 and 11 through 13 would have been obvious as a matter of law under 35 U.S.C. § 103.

The examiner's decision is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 CFR § 1.136(a).

AFFIRMED

BRADLEY R. GARRIS Administrative Patent Judge	)	
CHARLES F. WARREN Administrative Patent Judge	)	BOARD OF PATENT APPEALS AND INTERFERENCES
PAUL LIEBERMAN Administrative Patent Judge	)	

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